

CLAIMS

1. A process for dissolving actinic oxides, the process comprising performing the steps of:
- 5 (a) introducing the actinic oxides into a solution of nitric acid;
- (b) treating the acidic solution in order to substantially remove palladium; and
- 10 (c) treating with divalent silver.
2. A process as claimed in claim 1 which additionally comprises performing the steps of:
- 15 (d) further treating the acidic solution in order to substantially remove palladium; and
- (e) further treating with divalent silver.
- 20 3. A process as claimed in claim 1 or 2 wherein the actinic oxides comprise mixtures of UO_2 and PuO_2 or the mixed oxide $(\text{U}, \text{Pu})\text{O}_2$.
4. A process as claimed in claim 3 wherein the actinic oxide has a U:Pu ratio in
- 25 the region of 95:5.
5. A process as claimed in claim 3 wherein the actinic oxide has a U:Pu ratio in the region of 75:25.
- 30 6. A process as claimed in any one of claims 1 to 5 wherein the actinic oxides are comprised in spent nuclear fuel.

7. A process as claimed in any one of claims 1 to 6 wherein the actinic oxides are in the form of a solid, a slurry or a suspension.
5. 8. A process as claimed in any preceding claim wherein the treatment to substantially remove palladium comprises treatment by solvent extraction.
9. A process as claimed in claim 8 wherein said solvent extraction comprises extraction with triauryllamine, Alamine 336 in combination with tributyl phosphate and kerosene, a dialkyl sulphide or an organic phosphine sulphides or its derivative.
10. 10. A process as claimed in any one of claims 1 to 7 wherein the treatment to substantially remove palladium comprises ion exchange.
15. 11. A process as claimed in any one of claims 1 to 7 wherein the treatment to substantially remove palladium comprises denitration of the system by the addition of formic acid to cause palladium to precipitate from solution as the metal.
20. 12. A process as claimed in any preceding claim wherein the nitric acid is provided as an aqueous solution at a concentration of 4M to 12M.
13. A process as claimed in claim 12 wherein the concentration is 6M to 8M.
25. 14. A process as claimed in any preceding claim wherein the temperature of the nitric acid is maintained in the region of 10-50°C.
15. A process as claimed in claim 14 wherein the temperature is maintained in the region of 20-40°C.

16. A process as claimed in any preceding claim wherein the treatment with divalent silver comprises an electrolytic dissolution process.
17. A process as claimed in claim 16 wherein the process comprises the addition
5 of a source of monovalent silver to the system and treatment in an electrolyser to electrolytically regenerate divalent silver.
18. A process as claimed in claim 17 wherein the source of monovalent silver is silver nitrate.
- 10 19. A process as claimed in any preceding claim wherein the treatment with divalent silver is carried out at a temperature between 5° and 50°C.
20. A process as claimed in claim 19 wherein said temperature is between 15°
15 and 40°C.
21. A process as claimed in claim 20 wherein said temperature is between 20° and 30°C.
- 20 22. A process as claimed in any preceding claim wherein the steps of the process are carried out in either a batchwise or a continuous fashion.